UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/616,147	07/08/2003	Klaus Kunze	KOV-004	2078

36872 7590 08/27/2007

THE LAW OFFICES OF ANDREW D. FORTNEY, PH.D., P.C.
401 W FALLBROOK AVE STE 204
FRESNO, CA 93711-5835

EXAMINER	
TRINH, MICHAEL MANH	

ART UNIT	PAPER NUMBER
2822	

MAIL DATE	DELIVERY MODE
08/27/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/616,147	KUNZE ET AL.	
	Examiner	Art Unit	
	Michael Trinh	2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 June 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *41,43-46,51,53,54,56-65 and 96-164* is/are pending in the application.

4a) Of the above claim(s) *96-110,113-124,126-134 and 139-159* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *41,43-46,51,53,54,56-65,111,112,125,135-138 and 160-164* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

*** This office action is in response to Applicant's Amendment and RCE filed June 11, 2007. Claims 41,43-46,51,53-54,56-65, 96-164 are pending, in which claims 96-164 are non-elected.

*** The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

*** Note that using the relative term "high solubility" in withdrawn claim 159 renders the scope of the claim being unclear and indefinite, since it is high solubility with respect to which reference. Appropriate correction is required.

Claim Rejections - 35 USC § 103

1. Claims 41,43-46,56-61,62-65,111-112,125,160-164, are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiho et al (2003/0045632) taken with Jacobson et al (both 6,294,401 and 6,200,508) and Kim et al (6,355,198).

Shiho teaches (at paragraphs 38-93) a method for making a semiconductor film comprising at least the steps of: a) inkjet printing, offset printing , screen printing (paragraphs 110,153,54-64,162-167) a solution composition comprising passivated semiconductor nanoparticles, a first cyclic Group IVA compound of the formula SinRm , n is an integer of 3 or more and m is integer of 2n+2, wherein Si_nH_{2n+2} is mentioned at paragraph 44, wherein dopants of B, P, and As with at least alkyl group are mentioned at paragraphs 76-82, which is corresponding to claimed formula (1):(AHx)n, where n is from 3 to 8 and each A in the formula is independently Si, and/or a second cyclic Group IVA compound of the formula (2):(AHx)m(AHyRzy)p(ZR')q, (2) where (m+p+q) is from 3 to 12, each of the m instances of x is independently 0, 1 or 2, each of the p instances of y is independently 0, 1 or 2, each of the p instances of z is independently 0, 1 or 2, each of the p instances of (y+z) is independently 1 or 2, each of the q instances of w is independently 0 or 1, at least one of p and q is at least 1, each A in the formula (2) is independently Si, Z is selected from the group consisting of B, P and As, R' is R or H, and each R in the formula (2) is independently alkyl, aryl, aralkyl, a halogen, BHsR"2s, PHsR"2-s, AsHR"2-s or AHtR".sub.3-t, where s is 0 to 2, t is 0 to 3, and R" is alkyl, aryl, aralkyl, a halogen, or AH3, and a solvent (paragraphs 0102-0103,153) in a film/pattern on a substrate, wherein it may be patterned by the application of the liquid material and patterning may be

carried out at the same time by an ink jet method; and b) curing said printed solution composition film/pattern to form said semiconductor film (paragraphs 117,120,137,138), wherein curing the printed pattern comprises irradiating the printed composition (paragraphs 138,113,137,120,153), wherein the semiconductor film comprising a film particularly preferably having a thickness of 0.01 to 5 microns (paragraphs 0110). Re claims 42-44, wherein the composition comprises semiconductor silicon nanoparticles (paragraphs 60-64) and passivated as the silicon particles are dispersed in the silane composition. Re claims 45,111-112, wherein the composition including both first and second cyclic group IVA compound of silicon and dopants of B, P, As (at paragraphs 38-93), herein $Si_nH_2n_{+2}$ is mentioned at paragraph 44, wherein dopants of B, P, and As with at least alkyl group are mentioned at paragraphs 76-82. Re claims 46,58 wherein curing by heating so as to sintering the semiconductor film so as to dry the semiconductor film (paragraphs 117,120,137-138), wherein curing comprises irradiating the composition (paragraphs 120,138). Re claims 58-59, 125, wherein curing by heating so as to sintering the semiconductor film so as to dry the semiconductor film at a temperature at least about 200°C (paragraphs 117,120,137-138), wherein sintering temperature is at least about 300°C (paragraphs 117,120,137-138). Re claims 60-61, wherein the curing heat treatment is evacuated so as to treat in an inert argon gas or reducing hydrogen gas in chamber, inherently (paragraphs 117, 137).

Re claim 41, Shiho already teaches inkjet printing a semiconductor film having a thickness, particularly preferably of 0.01 to 5μm (paragraph 0110), while claim 41 recites an array of lines having a width of from 100nm to 100μm, a length of from 1 to 5000μm , and a thickness of from 0.01 to 1000 μm, and lacks forming the semiconductor film as a patterned semiconductor film from a solution, and by gravure printing.

However, Jacobson '401 teaches (at col 5, lines 34-60; col 3, lines 36-65; col 4, lines 32-64) printing passivated semiconductor nanoparticles to form a patterned semiconductor film on a substrate by using any of variety including spin coating, casting, screen printing, stamping, etc, wherein the patterned semiconductor film is used in forming a thin film transistor, wherein printing is performed by ink jetting the solution composition comprising a solvent and the passivated semiconductor nanoparticles onto the substrate to form a pattern (re further claim 56, col 5, lines 34-45, col 6, lines 1-10; col 4, lines 13-15; Fig 4, col 7, lines 10-20), wherein ink-jet

system is configured to deliver a selected of a series of solution, colloids, and/or dispersion of one or more materials, wherein the nanoparticles may be passivated at the surface by an organic capping group which is largely determined the solubility of the particles (col 4, lines 48-64), wherein by employing a screen printing process, the composition solution with the nanoparticles and the solvent is inherently deposited on the substrate through stencil on or over the substrate, and wherein the printing of the composition with solvent includes screen printing, gravure printing, lithography (re claim 57). Jacobson '508 also teaches (at Figures 1A-1C; col 2, line 31 through col 3) making a patterned semiconductor film by ink jet printing a pattern on a substrate, and curing the pattern to form the patterned semiconductor film by ink jet printing an ink having a composition solution comprising semiconductor particles having semiconductor properties such as silicon and a solvent, wherein the semiconductors may be dispersed or dissolved in an appropriate solvent. Kim teaches (at Figs 1,15,16; col 34, lines 13-50) printing and curing a composition to form an array of lines having a typical width of from 1μm to 10μm, a length of from 100μm , and a thickness as similar to a width and spacing of from 1μm to 10μm (re further claims 41,62-65,160-164).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the semiconductor film of Shiho as a patterned semiconductor film by inkjet printing, Gravure printing, offset printing, screen printing, and spin coating a solution composition comprising passivated semiconductor nanoparticles and a solvent onto a substrate to form a pattern, as taught by Jacobson (both '401 and '508) and Shiho above, wherein by employing the ink jet printing method for forming the pattern, the passivated semiconductor nanoparticles can be dissolved/soluble or dispersed in the solvent as further taught by Jacobson (both '401 and '508). This is because of the desirability to employ the ink-jet printing method or other printing processes for directly forming a plurality of patterned semiconductor films of a plurality of semiconductor thin film transistors, on desired and selected portions of the substrate without performing a photolithographic process for patterning, wherein by employing the ink-jetting method for depositing a pattern line, using a solution comprising passivated semiconductor nanoparticles dissolved/soluble in the solvent would effectively reduce and prevent clogging of the ink-jet nozzles (a commonly known problem in the ink-jet printing method). Moreover, it would have been obvious because a person of ordinary skill in the art

would have been motivated to combine the prior art to achieve the claimed invention and that there would have been a reasonable expectation of success when employing a composition solution in the ink jet printing method, and because "a person of ordinary skill has a good reason to pursue the known options within his or her technical grasp. If this lead to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense" for forming a plurality of semiconductor patterns on a substrate, and because ink jet printing method is a particular known technique was recognized as part of the ordinary capabilities. In re Supreme Court Decision in KSR International Co. v. Teleflex Inc. 82 USPQ2d, 1385 (2007). Furthermore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the semiconductor film of Shiho as an array of lines of a patterned semiconductor film having a typical width of from 1μm to 10μm, a length of from 100μm , and a thickness as similar to a width of from 1μm to 10μm by inkjet printing, gravure printing, offset printing, as taught by Kim and Shiho above. This is because of the desirability to form an array of lines of patterned semiconductor films having a desired dimensions on the substrate, and for used in manufacturing a plurality of semiconductor device.

The subject matter as a whole would have been obvious to one or ordinary skill in the art at the time the invention was made to select the portion of the prior art's range of thickness, as taught by Kim and Shiho, which is within the range of applicant's claims, because it has been held to be obvious to select a value in a known range by optimization for the best results, and would be an unpatentable modification, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation". *In Re Aller* 104 USPQ 233,255 (CCPA 1955); *In re Waite* 77 USPQ 586 (CCPA 1948); *In Re Swanson* 56 USPQ 372 (CCPA 1942); *In Re Sola* 25 USPQ 433 (CCPA 1935); and *In Re Dreyfus* 24 USPQ 52 (CCPA 1934).

2. Claims 51,53-54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiho et al (2003/0045632), Jacobson et al (both 6,294,401 and 6,200,508) and Kim et al (6,355,198), as applied to claims 41-46,56-61,62-65,111-112,125,160-164 above, and further of Tani et al (5,254,439).

The references including Shiho, Kim and Jacobson teach a method for making a semiconductor film as applied to claims 41-46,56-61,62-65,111-112,125,160-164 above. Jacobson '401 teaches (at col 5, lines 34-60; col 3, lines 36-43) printing a composition of semiconductor nanoparticles to form a patterned semiconductor film on a substrate by using any of variety including spin coating, casting, screen printing, stamping, wherein the printing of the composition with solvent includes screen printing, gravure printing, lithography. Jacobson '508 teaches (at Figures 1A-1C; col 2, line 31 through col 3) making a patterned semiconductor film by ink jet printing a pattern on a substrate, and curing the pattern to form the patterned semiconductor film by ink jet printing an ink through a patterned aperture mask 21. Kim teaches (at Figs 1,15,16; col 34, lines 13-50) printing and curing a composition to form an array of lines having a typical width of from 1μm to 10μm, a length of from 100μm , and a thickness as similar to a width and spacing of from 1μm to 10μm (re further claims 41,62-65,160-164). Shiho also teaches (at paragraph 110) depositing the composition by inkjet printing, spray coating, spin coating, and irradiating the composition with an ultraviolet light (paragraph 138).

Shiho thus lacks selectively irradiating the composition through a mask (claims 51-54)

However, Tani teaches (at Figs 2,3; col 5, line 60 through col 6) selectively irradiating the layer through a mask aligned on substrate as marked, and removing a portion of the layer after irradiating in order to form a plurality of patterned layers.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to pattern the semiconductor film of the references including Shiho and Jacobson (both) by selectively irradiating through a mask and removing a portion of the layer as taught by Tani. This is because these patterning techniques are alternative and art recognized equivalent for substitution in forming distinct patterned semiconductor films on the substrate so as a plurality of semiconductor thin film transistors can be fabricated at the same time.

3. Claims 135-138 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiho et al (2003/0045632), Jacobson et al (both 6,294,401 and 6,200,508) and Kim et al (6,355,198), as applied to claims 41-46,56-61,62-65,111-112,125,160-164 above, and further of Korgel (2003/0034486)

The references including Shiho, Kim and both Jacobson teach a method for making a semiconductor film as applied to claims 41-46,56-61,62-65,111-112,125,160-164 above.

Shiho already teaches (at paragraphs 0061-0062) forming silicon particles having a diameter of from 0.005 micron (5 nm as 1 micron equals to 1000nm), while claims 135-138 recites silicon particles having an average diameter of less than 5 nm or 3.5 nm.

However, Korgel teaches (at col 15, lines 12-30) forming silicon particles comprising nano-particles having an average diameter of about 5 nm, 3.5 nm, or 2 nm.

The subject matter as a whole would have been obvious to one or ordinary skill in the art at the time the invention was made to select the portion of the prior art's range of average diameter of silicon particles, as taught by Korgel, which is within the range of applicant's claims, because of the desirability to form silicon nanoparticles for forming very small devices, and because it has been held to be obvious to select a value in a known range by optimization for the best results, and would be an unpatentable modification, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation". *In Re Aller* 104 USPQ 233,255 (CCPA 1955); *In re Waite* 77 USPQ 586 (CCPA 1948); *In Re Swanson* 56 USPQ 372 (CCPA 1942); *In Re Sola* 25 USPQ 433 (CCPA 1935); and *In Re Dreyfus* 24 USPQ 52 (CCPA 1934).

Response to Amendment

4. Regarding restriction: Applicant remarked about newly added claims 96-104 in that claim 96 depends on active claim 43, and the restricted claims depend directly or indirectly form independent claim 41.

In response, independent claim 41 is a generic claim, and being currently considered and examined with elected species. Thus, upon the allowance of a generic claim, applicant will be entitled to consideration of claims to *additional species which are written in dependent form or otherwise include all the limitations of an allowed generic claim as provided by 37 CFR 1.141.* If claims are added after the election, applicant must indicate which are readable upon the elected species. MPEP § 809.02(a). Accordingly, Claims 96-110,113-124,126-134,139-159 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b).

5. Regarding prior arts:

Applicant's remarks filed June 11, 2007 with respect to pending claims have been considered but are moot in view of the new ground(s) of rejection.

Applicant apparently remarked that Shiho does not forming a pattern since Shiho teaches forming a desired pattern by exposing part of the coating film selectively using a photomask.

In response, this is noted and found unconvincing. First, Shiho clearly teaches (at paragraph 0153) that it "may be patterned by...the application of the liquid material and patterning may be carried out at the same time by an ink jet method". Thus, by employing an ink jet method, a pattern is formed on a substrate due to the liquid materials are ink-jetted from a nozzle. Second, Jacobson and Kim also further teach the desirability to directly form a pattern on a substrate without performing a photolithographic process for patterning.

Shiho also clearly teaches the application of liquid material by an ink jet method. Moreover, Jacobson et al (both '401 and '508) further teach using a solution of composition in an ink jet system. Clogging of the ink-jet nozzles is effectively reduced and avoided. Moreover, it would have been obvious because a person of ordinary skill in the art would have been motivated to combine the prior art to achieve the claimed invention and that there would have been a reasonable expectation of success when employing a composition solution in the ink jet printing method, and because "a person of ordinary skill has a good reason to pursue the known options within his or her technical grasp. If this lead to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense" for forming a plurality of semiconductor patterns on a substrate, and because ink jet printing method is a particular known technique was recognized as part of the ordinary capabilities. In re Supreme Court Decision in KSR International Co. v. Teleflex Inc. 82 USPQ2d, 1385 (2007).

****

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael M. Trinh whose telephone number is (571) 272-1847. The examiner can normally be reached on M-F: 9:00 Am to 5:30 Pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith can be reached on (571) 272-2429. The central fax phone number is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).
Oacs-21

Michael Trinh
Primary Examiner